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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
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EXAMINER

ART UNIT

PAPER NUMBER

DATE MAILED:

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.
09/376,063

Applicant(s)

Andoh

Examiner
Michael Datskovsky

Group Art Unit
2835



☒ Responsive to communication(s) filed on Dec 28, 1999

This action is **FINAL**.

Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) 1-14 is/are pending in the application.

Of the above, claim(s) _____ is/are withdrawn from consideration.

Claim(s) _____ is/are allowed.

☒ Claim(s) 1-14 is/are rejected.

Claim(s) _____ is/are objected to.

Claims _____ are subject to restriction or election requirement.

Application Papers

☒ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

The specification is objected to by the Examiner.

The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☒ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been
☒ received.

received in Application No. (Series Code/Serial Number) _____.

received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

Interview Summary, PTO-413

☒ Notice of Draftsperson's Patent Drawing Review, PTO-948

Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

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DETAILED ACTION

The examiner acknowledges the applicant's submission of the Election filed on 12/28/1999.

At this point claims 1-14 are elected without traverse, claims 15-19 are non-elected. Thus claims 1-14 are pending in the instant application.

Claim Objections

1. Claims 4 and 5 are objected to because of the following informalities:

In claim 4, page 11, line 25 - after "radiation plate" should be inserted - "with".

In claim 5, page 12, line 2 - after "conductivity" should be inserted "and" and after "attached" should be inserted "to". Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention

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3. Claim 5 is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. "Relay portion" claimed in line 2 has not been described in the disclosure and shown in the drawings.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-14 (claim 5 as best understood by examiner) are rejected under 35 U.S.C. 103(a) as being unpatentable over Lan et al in view of Bond et al.

Lan et al teach a package 510 structure figs.5A, 5B for a semiconductor device comprising: a substrate 517 having a main surface and a back surface; a semiconductor chip 513 formed on the main surface of said substrate 517; a package 514 covering said semiconductor chip 513; a plurality of radiation protrude electrodes 511N formed on the back surface of said substrate 517 in a chip 513 area where said semiconductor chip 513 is

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located, each of said radiation protrude electrodes formed with a first pitch; and a plurality of connection protrude electrodes 511A formed on the back surface of said substrate 517 in a peripheral area of said chip area and electrically connected to pads of said chip 513 (fig.5A), each of said connection protrude electrodes formed with a second pitch which is larger than the first pitch. Lan et al teach furthermore said radiation and connection protrude electrodes are solder bumps (balls); said substrate 517 includes radiation plate 561 with high thermal conductivity formed on the back surface in the chip region of said substrate 517, wherein said radiation protrude electrodes 511N are formed on said radiation plate 561 which has a portion 562 having high thermal conductivity and attached to said semiconductor chip 513 and the radiation plate 561 (through VIA 560A).

Regarding to the statements in the claim 1 (and also in the claims 9 and 15) that: "...each of said radiation protrude electrodes formed with a first pitch so that said radiation protrude electrodes make one body joining layer when the package structure is subjected to a heat treatment" and "...each of said connection protrude electrodes formed with a second pitch which is larger than the first pitch so that said connection protrude electrodes stay individual when the package structure is subjected to a heat treatment" examiner directs applicant's attention to the following facts:

p) Manipulating pitches of the solder balls is the only one factor (well known in the art, good example is: Rostoker - US patent 5,729,894) of many having an effect on the

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result of the soldering process, along with: distance between parts, sizes of the balls, applied temperature, sizes of wettable surfaces (design of a solder mask) etc.

b) The presence of process limitations (which these statements certainly are) in product claims, which product does not otherwise distinguish over the prior art, cannot impart patentability to that product. (In re Johnson, 157 USPQ 670, 1968).

c) “..one body joining layer...” or as it usually named “collapse solder interconnection” is also well known in the art (good example is: Thompson - US Patent 5,011,066) and often used for establishing a soldered connection between a heat sink and a substrate (good examples are: McLaughlin et al - US Patent 5,616,888, Septfons - US Patent 4,924,352 and Hanninghaus et al - US Patent 5,708,566).

Although Lan et al show the solder balls 511 having the same size and two different pitches (figs. 5A and 5B) this requirement is not present in the description. Bond et al teach a package structure figs. 1-2 for a semiconductor device comprising: a substrate 14 having a main surface and a back surface; a semiconductor chip 10 formed on the main surface of said substrate 14; a package 16 covering said semiconductor chip 10; a plurality of radiation protrude electrodes 18 formed on the back surface of said substrate in a chip 10 area where said semiconductor chip 10 is located, each of said radiation protrude electrodes formed with a first pitch(which is obviously shown in fig.2); and a plurality of connection protrude electrodes formed on the back surface of said substrate 14 in a peripheral area of said chip area and electrically connected to pads of said chip 10, each of

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said connection protrude electrodes formed with a second pitch which is larger than the first pitch. Bond et al teach furthermore said radiation and connection protrude electrodes are solder bumps (balls) having the same size (col.6, lines 47-51); said substrate 14 includes radiation plate 12 with high thermal conductivity, wherein said radiation protrude electrodes 18 are formed on said radiation plate 12 attached to said semiconductor chip 10. It would have been obvious to one skilled in the art at the time invention was made to employ the pitch of electrical connection balls big enough to achieve separate connections and pitch of the thermal connections balls small enough to achieve the collapse solder interconnection as it is shown by Bond et al in the device by Lan et al in order to improve a design of the device.

Regarding to claim 8: Lan et al teach all limitations of the claim except certain relationships between sizes of said first and second pitches and diameter of the solder balls.

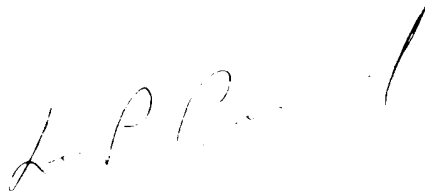
It would have been obvious to one having ordinary skill in the art at the time the invention was made to establish these relationships in the device by Lan et al, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

Regarding to the claims 9-14: the method steps are necessitated by the device structure as it is disclosed by Lan et al and Bond et al.

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6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: Hunninghaus et al (US Patent 5,708,566); Thompson (US Patent 5,011,066); Rostoker et al (US Patent 5,729,894); McLaughlin et al (US Patent 5,616,888); Septfons (US Patent 4,924,352) and Haley (US Patent 5,506,756).

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Datskovsky whose telephone number is (703) 306-4535.



M.D.

December 30, 1999

Leo P. Picard
Supervisory Patent Examiner
Technology Center 2800